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EXAMINER	
BECK, ALEXANDER S	
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	**Application No.**	**Applicant(s)**	
	10/811,310	BERKLEY ET AL.	
	Examiner	**Art Unit**	
	Alexander S. Beck	2629	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *02 March 2010*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-9,12-15,17-30,33,38,39,42,49,51,52,54,58,59,61-65 and 80-86* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☒ Claim(s) *1-8,18-25,29,30,33,58,62-65,80 and 84-86* is/are allowed.

6)☒ Claim(s) *9,12-15,17,26-28,38,39,42,49,51,52,54,59,61 and 81-83* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *24 March 2004* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *12/17/2009; 3/12/2010*.

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

5) ☐ Notice of Informal Patent Application

6) ☐ Other: _____.

DETAILED ACTION

Response to Amendment

1. Acknowledgment is made of the amendment filed March 2, 2010 ("Amend."), in which: claims 1-6, 9, 12-15, 17, 18, 27, 28, 30, 38, 52, 58, and 61-63 are amended; claims 10, 11, 16, 31, 32, 34-37, 40, 41, 43-48, 50, 53, 55-57, 60, and 66-79 are cancelled; new claims 80-86 are added; and the rejections of the claims are traversed.

Claims 1-9, 12-15, 17-30, 33, 38, 39, 42, 49, 51, 52, 54, 58, 59, 61-65, and 80-86 are currently pending and an Office action on the merits follows.

Information Disclosure Statement

2. The information disclosure statement filed December 17, 2009, has been acknowledged and considered by the examiner. An initialed copy of the PTO-1449 is included in this correspondence.

3. The information disclosure statement filed March 12, 2010, has been acknowledged and considered by the examiner. An initialed copy of the PTO-1449 is included in this correspondence.

Only the English language abstracts for the following documents have been considered because the remainder of the document is in a foreign language:

- Inoue et al., "A New Force Computation Method for Wire Driven Force Display," The Institute of Image Information and Television Engineers, HIR 2001-54, NIM 2001-63, 6 pages.
- Kushida et al., "A Proposal of Free Form Modeling Method Based on Glass-work Metahphor," The Institute of Electronics, Information and

Communication Engineers, Technical Report of IEICE, MVE2000-33 (2006-6), pp. 11-17.

• Sato et al., "A Proposal of 7 DOF Force Display Using 8 Strings", The Institute of Image Information and Television Engineers, HIR2000-100, NIM2000-100, 6 pages.

The following document has not been considered because it is in a foreign language and no English language translation has been provided:

• Sato, "Haptic Interface SPIDAR," Japanese publication, 7 pages, date unknown.

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

5. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to

consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

6. Claims 9, 12, 14, 26-28, 49, 54, 81 and 82 are rejected under 35 U.S.C. 103(a) as being unpatentable over Buoguila et al., *New Haptic Device For Human-Scale Virtual Environment: Scaleable-SPIDAR*, International Conference on Artificial Reality and Tele-Existence (ICAT97), Tokyo, Japan, pp. 93-98, 1997 ("Buoguila"), submitted with the Information Disclosure Statement filed March 12, 2010, in view of U.S. Patent No. 4,280,605 to Papadopoulos ("Papadopoulos").

As to claim 9, Buoguila discloses a haptic interface device to provide haptic interaction to a user manipulating a tool (Buoguila, Abstract; *see* p. 93), the haptic interface device comprising:

an attachment point configured to receive the tool (Buoguila, fingerings made of light plastic material to fit on the finger of an operator; *see* pp. 94-95 and Figure 7-b) and to be moved at least within a workspace (Buoguila, workspace defined by cubic frame that enclose a cave-like space; *see* pp. 94-95 and Figures 2 and 7-a);

a plurality of not more than four lengths of cables (Buoguila, l_0, l_1, l_2, l_3; *see* p. 95) and a plurality of not more than four cable guides (Buoguila, fulcrum at each of the four vertexes of the frame, A_0, A_1, A_2, A_3; *see* p. 95 and Figures 3-b and 4), each length of cable coupled to the attachment point (Buoguila, P(x, y, z); *see* p. 95 and Figure 4) and extending to a respective cable guide of the plurality of cable guides;

a plurality of tool translation effecter devices (Buoguila, *see* Figure 3-b) each having a spool (Buoguila, pulley; *see* p. 95 and Figure 3-b) with an end of a respective one of the plurality of cables coupled thereto such that, as the attachment point moves relative to the tool translation effecter device, the cable coupled thereto is retracted or

paid out accordingly, each tool translation effecter device configured to selectively vary an active tension on the cable (Buoguila, *see* pp. 94-95).

Buoguila does not disclose expressly a first, a second, a third, and a fourth brake, each respective brake coupled to a respective tool translation effecter device of the first, the second, the third, and the fourth tool translation effecter devices and configured to prevent rotation of the respective spool of the respective tool translation effecter device having the respective brake coupled thereto while the haptic interface device is powered down, as claimed.

Papadopoulos discloses a system comprising a motor for controlling spool, analogous in art with Buoguila, wherein the system further comprises a brake coupled to the motor and spool and configured to prevent rotation of the spool while the system is powered down (Papadopoulos, *see* col. 1, l. 64 – col. 2, l. 2). All of the components are known in Buoguila and Papadopoulos. The only difference is the combination of the "old elements" together by mounting them in a common tool translation effecter device.

As such, it would have been obvious to one having ordinary skill in the art at the time the invention was made to include the braking system of Papadopoulos into the tool translation effecter device of Buoguila, since the operation of the braking system is in no way dependent on the operation of other equipment not already included in Buoguila, and a braking system could be used in combination with the tool translation effecter device of Buoguila to achieve the predictable result of preventing rotation of the spool while the system is powered down. Furthermore, examiner respectfully submits that it would have been well within the preview of one having ordinary skill in the art to include four braking systems, as claimed, because Buoguila discloses a total of four tool translation effecter devices.

Thus, Buoguila as modified by Papadopoulos discloses a first, a second, a third, and a fourth brake, each respective brake coupled to a respective tool translation effecter

device of the first, the second, the third, and the fourth tool translation effecter devices (*e.g.*, one braking system for each spool as taught by Papadopoulos, wherein there are a total four spools in the system of Buoguila) and configured to prevent rotation of the respective spool of the respective tool translation effecter device having the respective brake coupled thereto while the haptic interface device is powered down (Papadopoulos, *see* col. 1, l. 64 – col. 2, l. 2).

As to claim 12, Buoguila discloses a haptic device for operation by a user (Buoguila, Abstract; *see* p. 93), comprising:

a user interface tool configured to be manipulated by the user (Buoguila, fingerings made of light plastic material to fit on the finger of an operator; *see* pp. 94-95 and Figure 7-b) and moved within a volume of space (Buoguila, workspace defined by cubic frame that enclose a cave-like space; *see* pp. 94-95 and Figures 2 and 7-a); a first, a second, a third, and a fourth tool translation effecter device (Buoguila, *see* Figure 3-b), each tool translation effecter device including a respective cable guide component coupled to a support structure in positions such that the respective cable guide components define between them a tetrahedron within the volume of space (Buoguila, fulcrum at each of the four vertexes of the frame, A_0, A_1, A_2, A_3; *see* p. 95 and Figures 3-b and 4), each of the tool translation effecter devices further including a respective spool (Buoguila, pulley; *see* p. 95 and Figure 3-b), a respective motor (Buoguila, motor; *see* p. 95 and Figure 3-b), and a respective encoder (Buoguila, rotary encoder; *see* p. 95 and Figure 3-b) configured to provide a signal corresponding to rotation of the respective spool;

and a plurality of cables (Buoguila, l_0, l_1, l_2, l_3; *see* p. 95) coupled to the user interface tool and comprising at least a first segment of cable (Buoguila, l_0; *see* p. 95), a second segment of cable (Buoguila, l_1; *see* p. 95), a third segment of cable (Buoguila, l_2; *see* p. 95) and a fourth segment of cable (Buoguila, l_3; *see* p. 95) extending form the user

interface tool (Buoguila, P(x, y, z); *see* p. 95 and Figure 4), and wherein an end of each of the first, the second, the third, and the fourth segments of cable are wound and unwound on the spool of a respective one of the tool translation effecter devices, each of the motors operable to drive the respective spool (Buoguila, *see* pp. 94-95).

Buoguila does not disclose expressly a first, a second, a third, and a fourth brake, each brake coupled to a respective tool translation effecter device of the first, the second, the third, and the fourth tool translation effecter devices and configured to prevent rotation of the respective spool of the respective tool translation effecter device having the brake coupled thereto while the haptic interface device is powered down, as claimed.

However, Buoguila is modified by Papadopoulos in the same manner and for the same reasons set forth in the discussion of claim 9 above. Thus, examiner respectfully submits that Buoguila as modified by Papadopoulos discloses a first, a second, a third, and a fourth brake, each brake coupled to a respective tool translation effecter device of the first, the second, the third, and the fourth tool translation effecter devices (*e.g.*, one braking system for each spool as taught by Papadopoulos, wherein there are a total four spools in the system of Buoguila) and configured to prevent rotation of the respective spool of the respective tool translation effecter device having the brake coupled thereto while the haptic interface device is powered down (Papadopoulos, *see* col. 1, l. 64 – col. 2, l. 2).

As to claim 14, Buoguila as modified by Papadopoulos discloses a processor system that receives the signals from the respective encoders, the processor system configured to determine movement of the user interface tool therefrom (Buoguila, *see* pp. 94-95).

As to claim 26, Buoguila as modified by Papadopoulos discloses wherein the processor system is configured to maintain a virtual environment within which the user

interface tool is operated, and to apply the actual force vector as feedback from the virtual environment to the user interface tool (Buoguila, *seep*. 94-98).

As to claim 27, Buoguila as modified by Papadopoulos discloses a remote tool; and a processor system in communication with the remote tool and configured to control operation of the remote tool in accordance with the movement and orientation of the user interface tool (Buoguila, *see* pp. 94-98).

As to claim 28, Buoguila as modified by Papadopoulos discloses wherein the processor system is configured to apply an actual force vector as feedback from the remote tool to the user interface tool (Buoguila, *see* pp. 94-98).

As to claim 49, Buoguila as modified by Papadopoulos discloses wherein the plurality of tool translation effecter devices includes at least a first, a second, a third, and a fourth tool translation effecter device, each of the first, the second, the third, and the fourth tool translation effecter devices having a respective cable guide of the plurality of cable guides, and where the respective cable guides are positioned relative to each other such that each respective cable guide occupies a vertex of a tetrahedron (Buoguila, rotary encoder, motor, pulley, and fulcrum at each of the four vertexes of the frame, A_0, A_1, A_2, A_3; *see* p. 95 and Figures 3-b and 4).

As to claim 54, Buoguila as modified by Papadopoulos discloses wherein the device comprises no more than four cables (Buoguila, *see* Figure 4).

As to claim 81, Buoguila as modified by Papadopoulos discloses wherein each respective tool translation effecter device of the plurality of tool translation effecter devices includes a respective encoder (Buoguila, rotary encoder; *see* Figure 3-b)

configured to provide a signal corresponding to rotation of the respective spool of the respective tool translation effecter device (Buoguila, *see* pp. 94-95), and wherein each respective brake selectively locks in position the respective encoder of the respective tool translation effecter device having the respective brake coupled thereto when actuated (*e.g.*, when the spool is locked as taught by Papadopoulos, the encoder position is locked as a result because the rotating position of the encoder is dependent upon the rotation of the spool).

As to claim 82, Buoguila as modified by Papadopoulos discloses wherein each respective brake locks in position the respective encoder of the respective tool translation effecter device having the respective brake coupled thereto when actuated (*e.g.*, when the spool is locked as taught by Papadopoulos, the encoder position is locked as a result because the rotating position of the encoder is dependent upon the rotation of the spool).

7. Claim 15 is rejected under 35 U.S.C. 103(a) as being unpatentable over Buoguila, *New Haptic Device For Human-Scale Virtual Environment: Scaleable-SPIDAR*, International Conference on Artificial Reality and Tele-Existence (ICAT97), Tokyo, Japan, pp. 93-98, 1997 in view of U.S. Patent No. 4,280,605 to Papadopoulos as applied to claims 9, 12, 14, 26-28, 49, 54, 81, and 82 above, and further in view of U.S. Patent No. 5,440,476 to Lefkowitz et al. ("Lefkowitz").

As to claim 15, neither Buoguila nor Papadopoulos disclose expressly wherein the processor system is configured to compensate for changes in effective diameter of the spools of the first, the second, the third, and the fourth tool translation effecter devices due to the respective cable being wound and unwound from the respective spool.

Lefkowitz discloses a system for positioning a work point in a three dimensional space having a plurality of positioning devices, analogous in art with Buoguila, where

each positioning device is a power-driven reeving system that can accurately take up and release the desired amounts of cable as required (Lefkowitz, *see* col. 4, ll. 3-6). Each reeving system is a drum/spooling mechanism, and is driven by a power motor to effect take up and release (Lefkowitz, *see* col. 4, ll. 6-8). The unused length of the cable may be wound onto the spooling mechanism as the cable is taken up (Lefkowitz, *see* col. 4, ll. 8-10). For a long cable, the diameter of the spool may change as cable is taken up or released, thereby changing the speed of cable take up and release, even though motor speed is kept constant (Lefkowitz, *see* col. 4, ll. 10-13). To compensate for this effect and maintain a constant take up and release speed, compensating means are provided for adjusting the spool motor speed as the spool diameter changes (Lefkowitz, *see* col. 4, ll. 14-17).

At the time the invention was made it would have been obvious to one having ordinary skill in the art to further modify the teachings of Buoguila and Papadopoulos such that compensating means are provided to adjust the spool motor speed as the spool diameter changes, as taught by Lefkowitz. As one of ordinary skill in the art would appreciate, the suggestion/motivation for doing so would have been to compensate for any changing speed of the cable as it is taken up and released as a result of a change in the effective diameter of the spool. Thus, Buoguila as modified by Papadopoulos and Lefkowitz discloses wherein the processor system is configured to compensate for changes in effective diameter of the spools (Lefkowitz, *see* col. 4, ll. 3-17) of the first, the second, the third, and the fourth tool translation effecter devices (*e.g.*, one compensating means for each spool as taught by Lefkowitz, wherein there are a total four spools in the system of Buoguila) due to the respective cable being wound and unwound from the respective spool (Lefkowitz, *see* col. 4, ll. 10-13).

8. Claims 13, 42, and 59 are rejected under 35 U.S.C. 103(a) as being unpatentable over Buoguila, *New Haptic Device For Human-Scale Virtual Environment: Scaleable-*

SPIDAR, International Conference on Artificial Reality and Tele-Existence (ICAT97), Tokyo, Japan, pp. 93-98, 1997 in view of U.S. Patent No. 4,280,605 to Papadopoulos as applied to claims 9, 12, 14, 26-28, 49, 54, 81, and 82 above, and further in view of U.S. Patent No. 6,104,380 to Stork et al. ("Stork").

As to claim 13, neither Buoguila nor Papadopoulos discloses expressly a sensor array configured to detect roll, pitch, and yaw of the user interface tool, as claimed. Stork discloses an interface device for inputting data in a three dimensional space, analogous in art with Buoguila, the interface device comprising a hand manipulated tool (Stork, 150) having a sensor array configured to detect roll, pitch, and yaw of a tool and wirelessly transmit signals accordingly (Stork, *see* col. 5, ll. 46-57).

All of the components pats are known in Buoguila, Papadopoulos, and Stork. The only difference is the combination of the "old elements" together into a common input device. Thus, it would have been obvious to one having ordinary skill in the art at the time the invention was made to include the sensor array taught by Stork into the haptic tool of Buoguila and Papadopoulos, since the operation of the sensor array is in no way dependent on the operation of the other equipment of the tool, and a sensor array could be used in combination with a haptic tool in any interface device to achieve the predictable results of providing signals corresponding to at least one of roll, pitch, and yaw. Moreover, as one of ordinary skill in the art would appreciate, the suggestion/motivation for doing so would have been to provide the haptic tool of Buoguila and Papadopoulos with a greater degree of sensitivity.

As to claim 42, Buoguila as modified by Papadopoulos and Stork discloses a processor system coupled to receive information from the sensor array and coupled to receive signals from the respective encoders, the processor system configured to

determine movement and orientation of the tool therefrom (Buoguila, *see* pp. 94-98) (Stork, *see* col. 5, ll. 46-57).

As to claim 59, neither Buoguila nor Papadopoulos disclose expressly a sensor array associated with the attachment point and configured to provide signals corresponding to at least one of roll, pitch, and yaw of the tool, as claimed. However, Buoguila and Papadopoulos are modified by Stork in the same manner and for the same reasons set forth in the discussion of claim 13 above. Thus, examiner respectfully submits that Buoguila as modified by Papadopoulos and Stork discloses a sensor array associated with the attachment point and configured to provide signals corresponding to at least one of roll, pitch, and yaw of the tool (Stork, *see* col. 5, ll. 46-57).

9. Claims 17 and 51 are rejected under 35 U.S.C. 103(a) as being unpatentable over Buoguila, *New Haptic Device For Human-Scale Virtual Environment: Scaleable-SPIDAR*, International Conference on Artificial Reality and Tele-Existence (ICAT97), Tokyo, Japan, pp. 93-98, 1997 in view of U.S. Patent No. 4,280,605 to Papadopoulos as applied to claims 9, 12, 14, 26-28, 49, 54, 81, and 82 above, and further in view of U.S. Patent No. 5,305,429 to Sato et al. ("Sato").

As to claim 17, neither Buoguila nor Papadopoulos disclose expressly wherein the processor system is configured to establish an initial position of the tool be retracing, in turn, each of the first, the second, the third, and the fourth segments of cable to a known length position, as claimed.

Sato discloses a haptic device having an attachment point connected through a plurality of cables to a spool and rotary encoder located in four corners of a three-dimensional workspace, analogous in art with Buoguila. By counting the number of pulses generated by the rotary encoder as the spool rates, a change in the length from the

fulcrum of the line to the attachment point can be calculated (Sato, col. 4, ll. 6-20). Furthermore, Sato discloses that by giving an initial value of the length of the cables and, further, by accumulating and adding the amounts of change, the length from the fulcrum of the line to the attachment point can be measured in a real time manner (Sato, col. 4, ll. 20-27).

At the time the invention was made it would have been obvious to one having ordinary skill in the art to further modify the haptic device of Buoguila and Papadopoulos such that an initial value of the length of the cables was established, as taught by Sato. As one of ordinary skill in the art would appreciate, the suggestion/motivation for doing so would have been to initialize the location of the attachment point prior to detecting a changing length (Sato, col. 4, ll. 20-27). Thus, Buoguila as modified by Papadopoulos and Sato discloses establishing an initial length of the cables.

Buoguila discloses wherein the coordinates (x, y, z) origin of the haptic device are set to the center of a 3m x 3m x 3m framework (Buoguila, p. 95). The length of the cables is known at this center of the 3m x 3m x 3m framework, *e.g.*, sqrt(1.5^2+1.5^2+1.5^2). Thus, examiner respectfully submits that it would have been within the purview of one having ordinary skill in the art to position the tool at the coordinate origin during an initialization because an initial value of the length of the cables is known, as desired by Sato, at the center of the 3m x 3m x 3m framework (Buoguila, *see* p. 95).

As to claim 51, neither Buoguila nor Papadopoulos discloses expressly establishing means for establishing, during an initial procedure, a distance between each of the tool translation effecter devices and the attachment point, as claimed. However, Buoguila and Papadopoulos are modified by Sato in the same manner and for the same reasons set forth in the discussion of claim 17 above. Thus, examiner respectfully submits that Buoguila as modified by Papadopoulos and Stork disclose establishing

means for establishing, during an initial procedure, a distance between each of the tool translation effecter devices and the attachment point *e.g.*, sqrt($1.5^2+1.5^2+1.5^2$) at the coordinates origin of the 3m x 3m x 3m framework.

10. Claim 52 is rejected under 35 U.S.C. 103(a) as being unpatentable over Buoguila, *New Haptic Device For Human-Scale Virtual Environment: Scaleable-SPIDAR*, International Conference on Artificial Reality and Tele-Existence (ICAT97), Tokyo, Japan, pp. 93-98, 1997 in view of U.S. Patent No. 4,280,605 to Papadopoulos and U.S. Patent No. 5,305,429 to Sato as applied to claims 17 and 51 above, and further in view of U.S. Patent No. 6,104,380 to Stork.

As to claim 52, neither Buoguila, Papadopoulos, nor Sato disclose expressly wherein the establishing means includes a sensor array is configured to provide signals to each of a roll, pitch, and a yaw of the tool, as claimed. However, Buoguila, Papadopoulos, and Sato are modified by Stork in the same manner and for the same reasons set forth in the discussion of claim 13 above. Thus, examiner respectfully submits that Buoguila as modified by Papadopoulos, Sato, and Stork discloses a sensor array is configured to provide signals to each of a roll, pitch, and a yaw of the tool (Stork, *see* col. 5, ll. 46-57). Examiner respectfully submits that such a combination would implicitly suggest providing said roll, pitch, and yaw of the tool during an initialization procedure so long as the haptic device is on and operating.

11. Claims 38, 61, and 83 are rejected under 35 U.S.C. 103(a) as being unpatentable over Buoguila, *New Haptic Device For Human-Scale Virtual Environment: Scaleable-SPIDAR*, International Conference on Artificial Reality and Tele-Existence (ICAT97), Tokyo, Japan, pp. 93-98, 1997 in view of U.S. Patent No. 5,305,429 to Sato.

As to claim 38, Buoguila discloses a method of operating a cable based haptic interface device (Buoguila, Abstract; *see* p. 93) having four segments of cable (Buoguila, l_0, l_1, l_2, l_3; *see* p. 95), comprising:

each segment of cable coupled to a tool (Buoguila, fingerings made of light plastic material to fit on the finger of an operator; *see* pp. 94-95 and Figure 7-b) and having a respective length extending from the tool to a respective vertex of a tetrahedron (Buoguila, four vertexes of the frame, A_0, A_1, A_2, A_3; *see* p. 95 and Figures 3-b and 4) such that, as the tool is moved closer to any respective vertex of the tetrahedron, the respective length of the segment of cable extending from the tool to the respective vertex is drawn in, thereby decreasing the respective length of the respective segment of cable, and as the tool is moved away from any respective vertex of the tetrahedron, the respective length of the segment of cable extending from the tool to the respective vertex is fed out, thereby increasing the respective length of the respective segment of cable;

selectively applying active tension to each of the four segments of cable;

tracking changes in length of each of the four segments of cable;

deriving a change of position of the tool on the basis of tracked changes in length of each of the four segments of cable (Buoguila, *see* pp. 94-95).

Buoguila does not disclose expressly: a specified calibration point; during a calibration, positioning the tool at a specified single calibration point from which respective reference lengths of each of the four segments of cable is known; and establishing the respective length of each of the four segments of cable based at least on the tool being positioned at the calibration point and on the respective reference lengths of each of the four segments of cable, as claimed.

Sato discloses a haptic device having an attachment point connected through a plurality of cables to a spool and rotary encoder located in four corners of a three-dimensional workspace, analogous in art with Buoguila. By counting the number of pulses generated by the rotary encoder as the spool rates, a change in the length from the

fulcrum of the line to the attachment point can be calculated (Sato, col. 4, ll. 6-20). Furthermore, Sato discloses that by giving an initial value of the length of the cables and, further, by accumulating and adding the amounts of change, the length from the fulcrum of the line to the attachment point can be measured in a real time manner (Sato, col. 4, ll. 20-27).

At the time the invention was made it would have been obvious to one having ordinary skill in the art to modify the haptic device of Buoguila such that an initial value of the length of the cables was established, as taught by Sato. As one of ordinary skill in the art would appreciate, the suggestion/motivation for doing so would have been to initialize the location of the attachment point prior to detecting a changing length (Sato, col. 4, ll. 20-27). Thus, Buoguila as modified by Papadopoulos and Sato discloses establishing an initial length of the cables.

Buoguila discloses wherein the coordinates (x, y, z) origin of the haptic device are set to the center of a 3m x 3m x 3m framework (Buoguila, p. 95). The length of the cables is known at this center of the 3m x 3m x 3m framework, *e.g.*, sqrt(1.5^2+1.5^2+1.5^2). Thus, examiner respectfully submits that it would have been within the purview of one having ordinary skill in the art to position the tool at the coordinate origin during an initialization because an initial value of the length of the cables is known, as desired by Sato, at the center of the 3m x 3m x 3m framework (Buoguila, *see* p. 95). As such, the specified single calibration point from which respective lengths of each of the four segments of cable is known, as claimed, is at the center of the 3m x 3m x 3m framework. Furthermore, by placing the tool at this coordinate origin, *i.e.*, claimed "calibration point", the length of each of the four segments of cable is established as approx. sqrt(1.5^2+1.5^2+1.5^2).

As to claim 61, Buoguila as modified by Sato discloses selecting a value of active tension applied to each of the four cable segments on the basis of the selected force vector that corresponds to the actual response feedback force vector to be applied to the tool (Buoguila, *see* p. 94-95).

As to claim 83, Buoguila as modified by Sato discloses wherein positioning a tool having four cables coupled thereto at a specified single calibration point from which respective reference lengths of each of the four cables is known includes manually positioning the tool at the specified single calibration point (*e.g.*, see discussion of claim 38 above).

12. Claim 39 is rejected under 35 U.S.C. 103(a) as being unpatentable over Buoguila, *New Haptic Device For Human-Scale Virtual Environment: Scaleable-SPIDAR*, International Conference on Artificial Reality and Tele-Existence (ICAT97), Tokyo, Japan, pp. 93-98, 1997 in view of U.S. Patent No. 5,305,429 to Sato as applied to claims 38, 61, and 83 above, and further in view of U.S. Patent No. 6,104,380 to Stork.

As to claim 39, neither Buoguila nor Sato disclose expressly measuring rotation of the tool about one or more of three mutually perpendicular axes, as claimed. Stork discloses an interface device for inputting data in a three dimensional space, analogous in art with Buoguila and Sato, the interface device comprising a hand manipulated tool (Stork, 150) having a sensor array configured to detect roll, pitch, and yaw of a tool, *i.e.*, measure rotation of the tool about one or more of three mutually perpendicular axes, and wirelessly transmit signals accordingly (Stork, *see* col. 5, ll. 46-57).

All of the components pats are known in Buoguila, Sato, and Stork. The only difference is the combination of the “old elements” together into a common input device. Thus, it would have been obvious to one having ordinary skill in the art at the time the

invention was made to include the sensor array taught by Stork into the haptic tool of Buoguila and Sato, since the operation of the sensor array is in no way dependent on the operation of the other equipment of the tool, and a sensor array could be used in combination with a haptic tool in any interface device to achieve the predictable results of providing signals corresponding to at least one of roll, pitch, and yaw. Moreover, as one of ordinary skill in the art would appreciate, the suggestion/motivation for doing so would have been to provide the haptic tool of Buoguila and Sato with a greater degree of sensitivity.

Allowable Subject Matter

13. Claims 1-8, 18-25, 29, 30, 33, 58, 62-65, 80, and 84-86 are allowed.

Response to Arguments

14. Applicant's arguments with respect to claims 9, 12 and 38 have been considered but are moot in view of the new grounds of rejection.

Conclusion

15. Applicant's submission of an information disclosure statement under 37 CFR 1.97(c) with the fee set forth in 37 CFR 1.17(p) on March 12, 2010, prompted the new grounds of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL.** See MPEP § 609.04(b). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not

mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Alexander S. Beck whose telephone number is (571) 272-7765. The examiner can normally be reached on M-F, 8AM-5PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Sumati Lefkowitz can be reached on (571) 272-3638. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Alexander S. Beck/
Primary Examiner, Art Unit 2629

Dated: March 27, 2010